

# URBAN ASSAULT VEHICLE

## SOME IDEAS

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## Origin of This Brief



What more can the vehicle do to support the squad?  
Intended to spark thought and not be comprehensive.



### 30 Year Plan

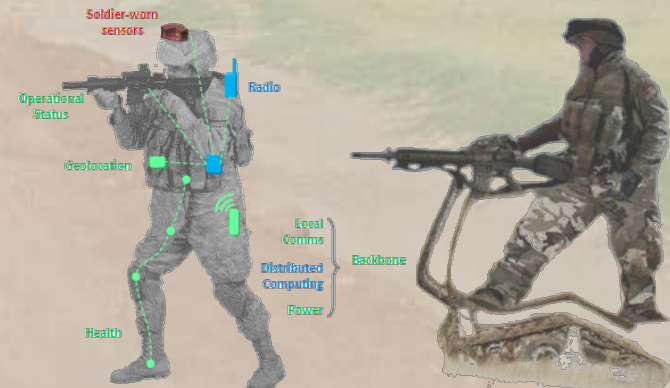
Vehicle as a Member of the Squad  
Focus: man / machine teaming



### Dismount Support

(Exoskeleton, robots, personal mobility)

- Power
- Information/ networking
- Movement
- Resupply
- Tactical movement







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# Exoskeletons: How to Support?



LM: Human Universal Load Carrier, or HULC



SARCOS

Sarcos XOS 2 suit- 25x strength amplification, but still **tethered**

Uses up to 3.5 kilowatts

*Data Source: Internet*

- 200 pounds lift
- 1000 watts of power
- Marching at up to 7 mph reduces
- Battery-draining "burst" at 10mph is the max

*Data Source: Internet*

Kubota's ARM-1 will sell as a productivity aid for fruit picking and any activity where a worker's arms are held above their shoulders for extended periods. (Not a military-only technology)



Kubota



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# Personal Mobility Devices: How to Support?



- Reconnaissance
- May be necessary for urban maneuver
- Distributed survivability  
(See Lanchester Equations)







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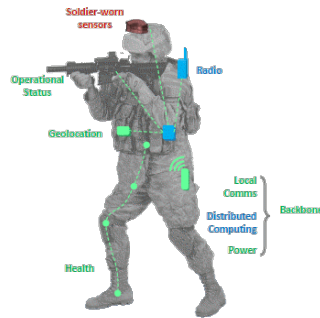
## Questions...



- How do you rapidly get in/out of a vehicle in an exoskeleton (or personal mobility device)?
  - Seatbelts, power connections, why not have heavy doors?
- How do you maintain seamless transition for infantry inside vehicle to outside?



Augmented reality



- How do you charge the batteries?

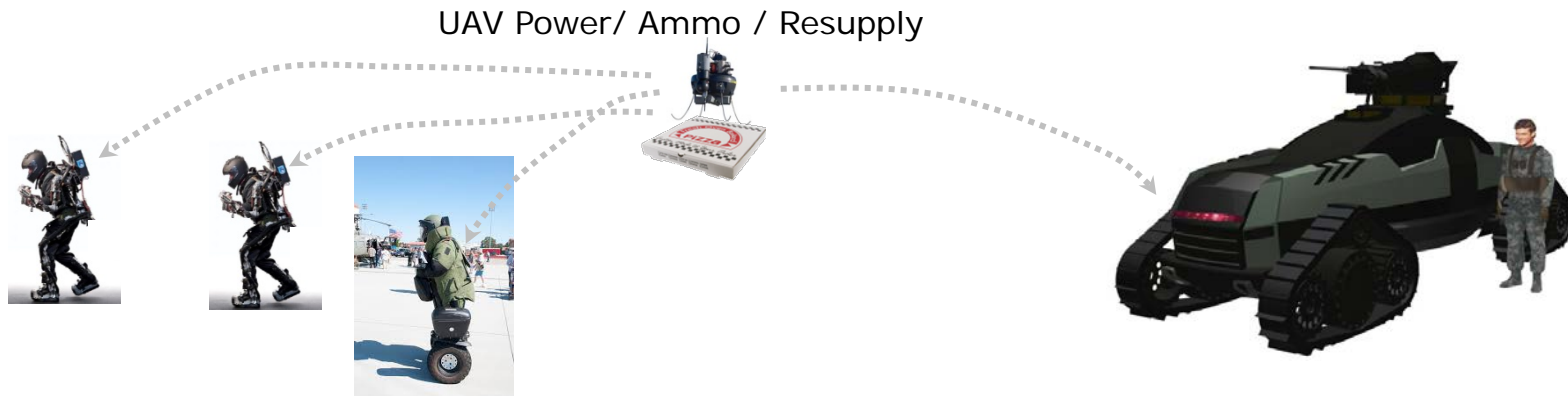


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# Vehicle as Infantry Projection (Power and Information Logistics)



- Tethered or untethered?
- Hub of power for UAVs, UGVs, exoskeletons, personal mobility
- Untethered might be like hockey (switching out at the bench for a recharge and then back to the action)
  - Hot swap batteries on surface of vehicle (like power drill)
  - Resupply ammo w/ UAV? Very “crusader-like”



Optical communications link? (if EM Jammed....)

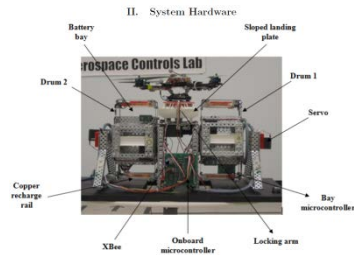


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# Autonomous Recharge of Soldier Systems, Exoskeletons, Etc LOTS of Potential Solutions



- Physically fly and hotswap batteries



MIT/ Boeing demo - autonomous battery hotswapping on UAV

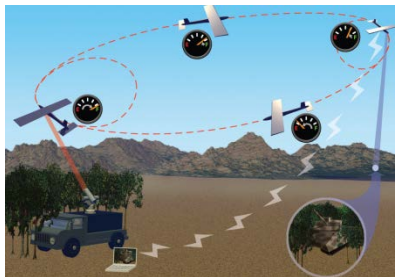
- Fly UAV to inductively charge device



University of Nebraska's NIMBUS Lab has developed unmanned quadcopters that can fly around and wirelessly transmit power to devices.

At 20cm (8in) — the optimum distance is defined by the wavelength of the oscillating power — the quadcopter system can transmit 5.5 watts with an efficiency of 35%.

- LASERed Power



The DARPA SHEDS program (Super High Efficiency Diode Sources) has a goal of developing 80% efficient diode arrays; efficiencies over 70% have been demonstrated.

LaserMotive, using internal funds, has built and operated a complete transportable power beaming system which delivered several hundred watts to a moving vehicle over a range of 1 km, and in excess of 1,000 watts at slightly shorter range. The system was operated repeatedly at NASA Dryden Flight Research Center (Edwards AFB) in November 2009, winning the 2009 NASA Centennial Challenge for Beamed Power.

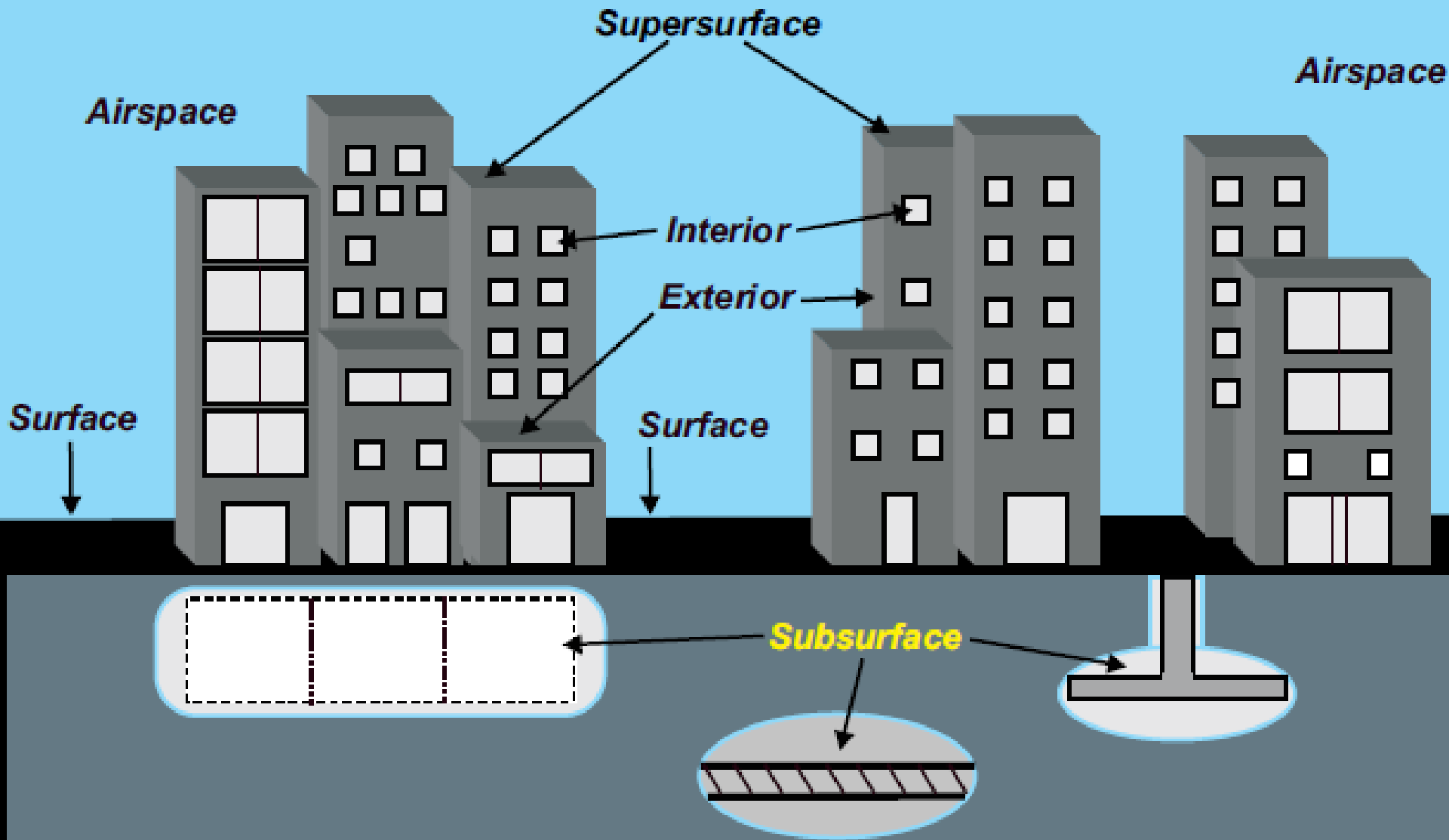
Can also transmit data, much lower power than DE weapons. Downside – smoke = jamming.





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# Urban Environment is 3d How Can the Vehicle Help?



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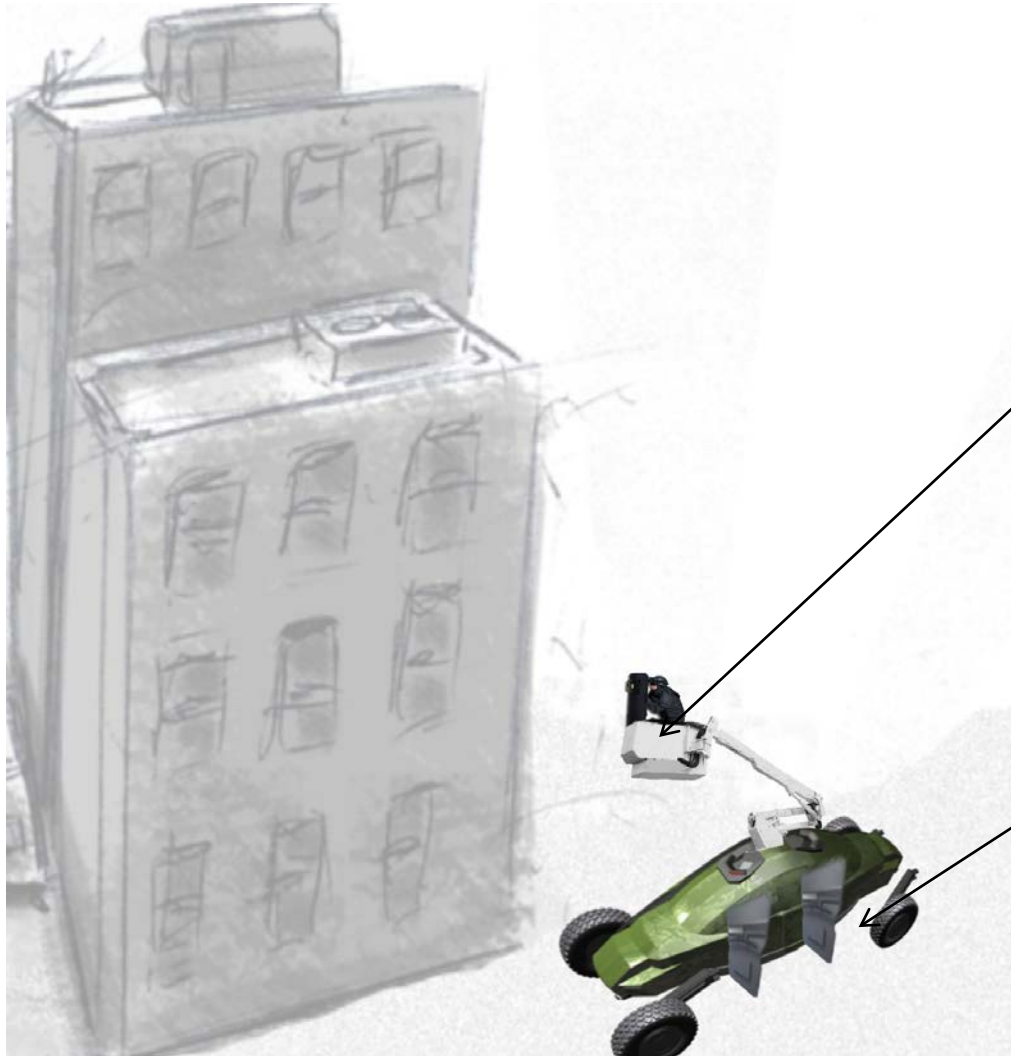


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## 3d Assault (Provide new access to roof and other levels)



### ***MOUT VERTICAL ASSAULT VEHICLE*** ***Lethality is Not Always Weaponry it can be MANEUVER***

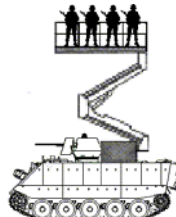


- Could add attachments to boom (or UAV)

- Door/ window breacher
- Launch c4isr balls into windows?



- Add ballistic shields
  - Armored doors
  - Could be purely external
- Heavily armored doors could pop out on swing arms (light armor closing door for opening) not shown





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# Autonomous Boom Controls



- Install camera on bucket
- Soldier points at window(s) on touch screen and bucket moves stealthily, quickly, and autonomously
- Need to build it and experiment (tactics+technology)

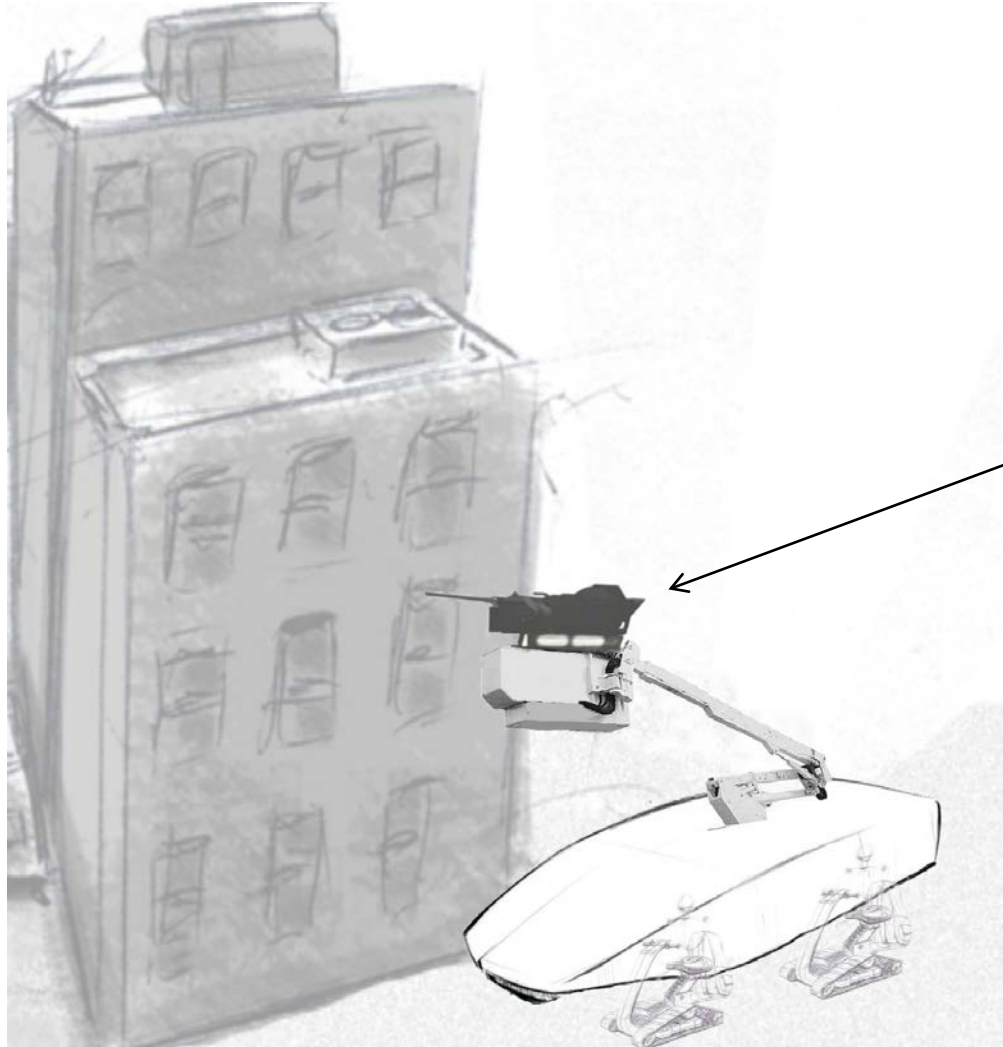






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# Can a Weapon Station Be Elevated?



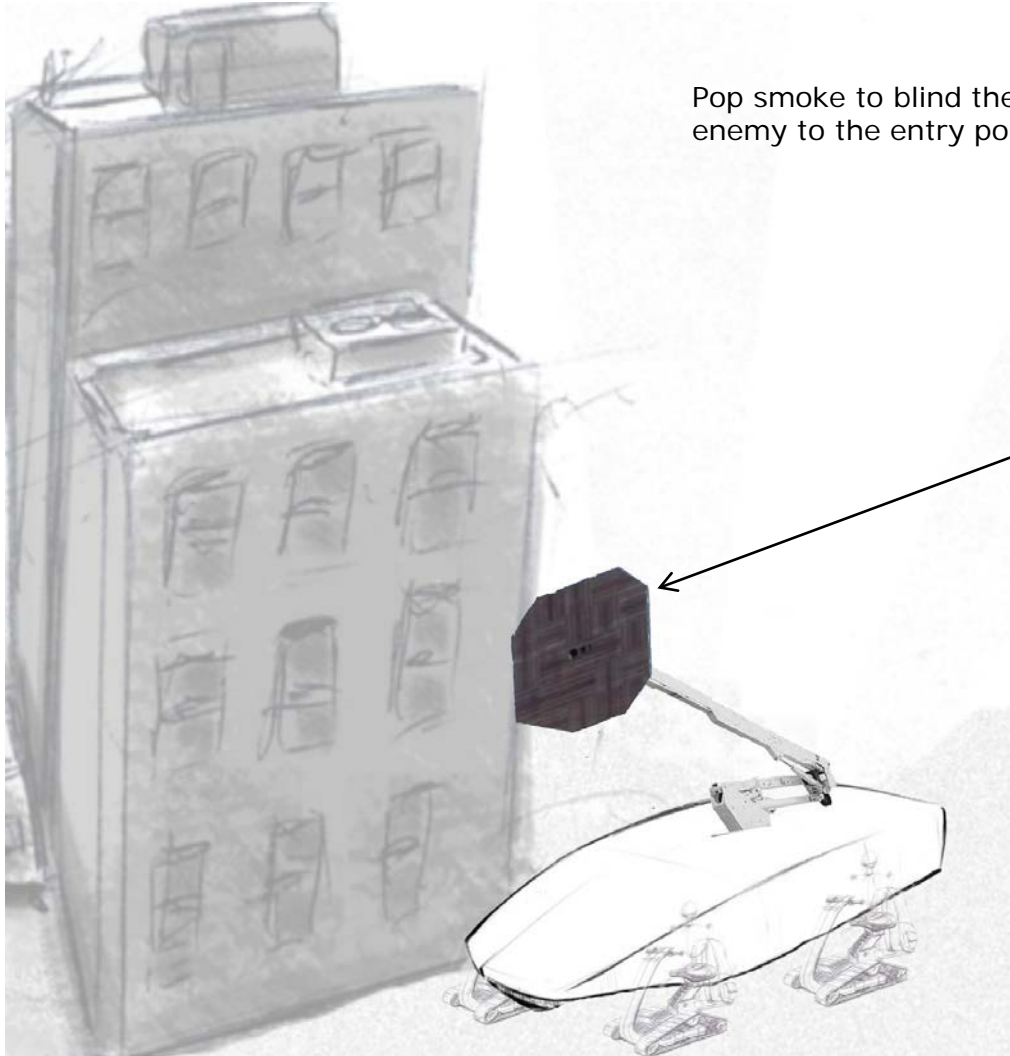
Remote or manned  
weapon – boom could also  
be used to enter at roof or  
other windows

Would require recoilless  
weapons



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# Mount a Non-Lethal Device



Pop smoke to blind the enemy to the entry point?

Could mount **Solid State Active Denial Technology (SS-ADT)** on a boom for non lethal.

Maybe there should be a number of "toys" to mount on the boom.  
(Like tractor 3 point hitch)





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# With Tethering We Might Be Able To Combine UAVs With the Vehicle



Tethered quadcopter capable of lifting remote weapon or man. Super hovermast. (Could also fly up a grapple hook for cable entry).

World's first manned flight with an electric multicopter

<http://www.youtube.com/watch?v=L75ESD9PBOw>

Is there a new role for a WASP II in the urban fight?



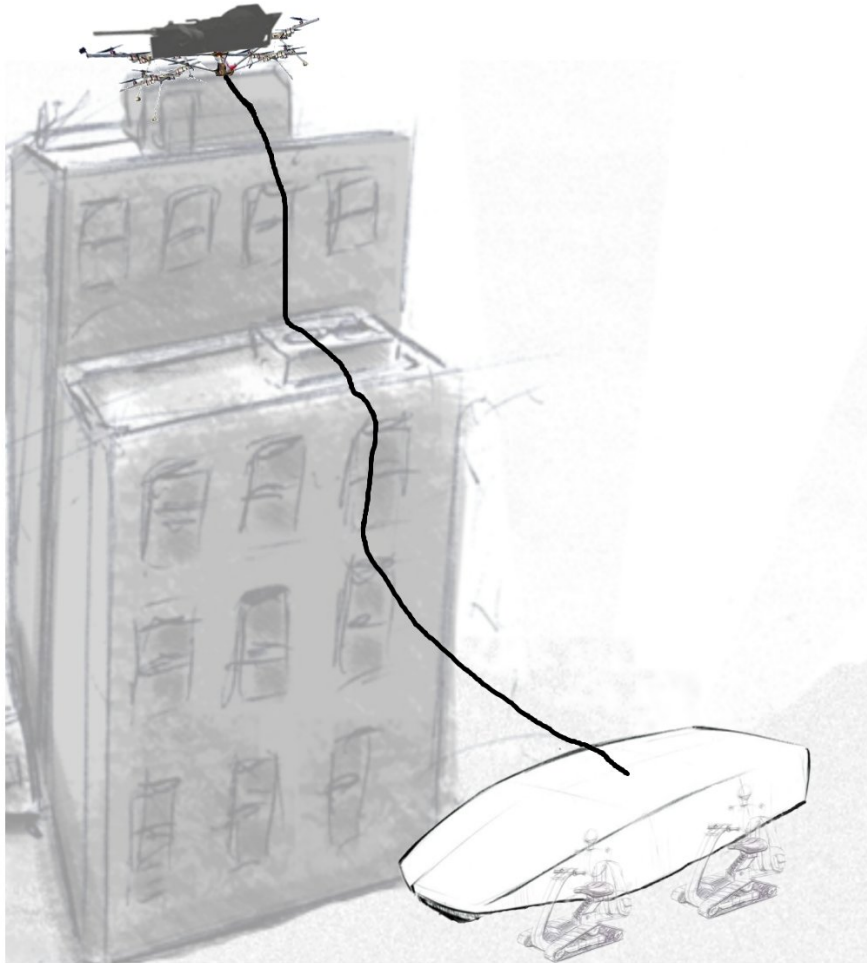
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# Flying Gun Overwatch Truly Modular (½ Tank/ ½ UAV)



- Tethered gun system capable of reaching rooftop
- Vehicle supplies power
  - Difficult to jam (not wireless)

More crazy:

- "Bank tube" ammo resupply?



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# SWOTBOT Howe&Howe Adaptable / Modular Infantry Support



It serves as a robotic ballistic shield, door breacher and vehicle/debris remover when the environment is deemed unsafe



<http://bangordailynews.com/slideshow/maine-machinists-unveil-the-future-of-swat-with-unmanned-police-tank-in-aftermath-of-boston-bombs/>



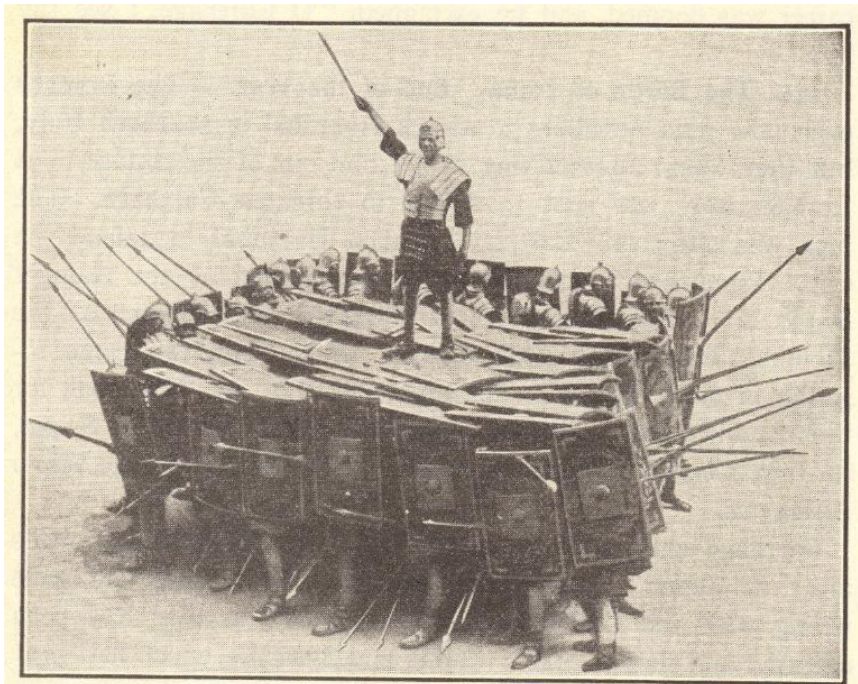


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# Can Exoskeleton or Personal Mobility Infantry Swarm to Form a "Vehicle"?



- Benefit – able to transition to support a 3d battlefield (urban)
- Dispersion when it makes sense



THE TORTOISE FORMATION—THE ANCIENT FORERUNNER OF THE MODERN "TANK"

Posed by English guardsmen acting the part of Roman soldiers. When fortifications were attacked, the heavy-armed soldiers held their shields arranged in a formation known as the *testudo*, or tortoise, for protection from hostile weapons.

from

or





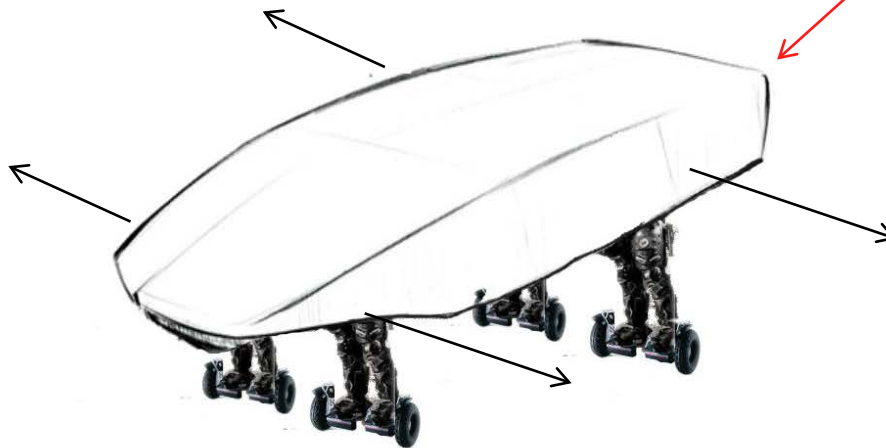


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# Exoskeleton Based Wheeled Walking Machine (Flintstones Meet the Jetsons)



(Yes it's a crappy idea)  
Challenge: How might this work?



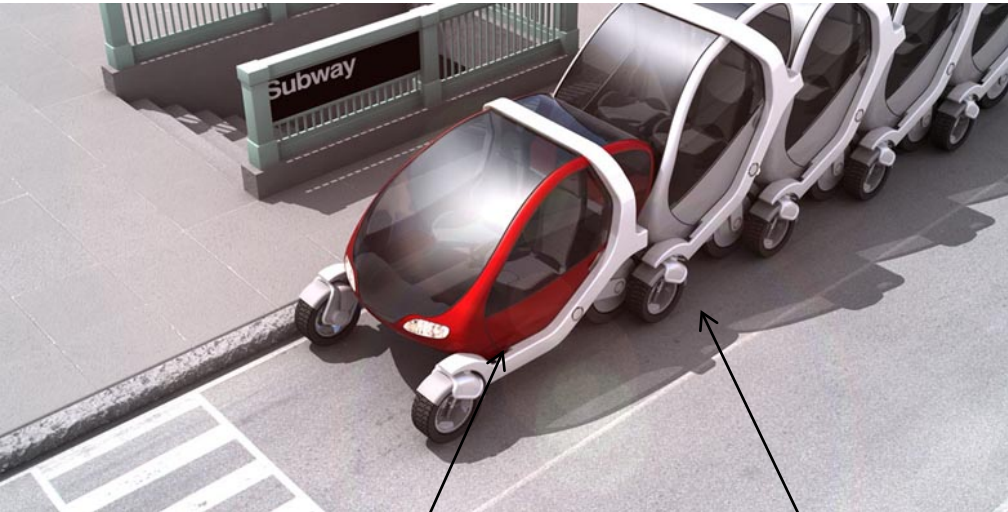
Personal mobility devices  
move "vehicle" into fight.  
Dismount leaves vehicle  
shell only.

Shown wheeled  
exoskeletons



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# Another Way of Doing the Turtle Formation



Armor req'd  
on 5 sides

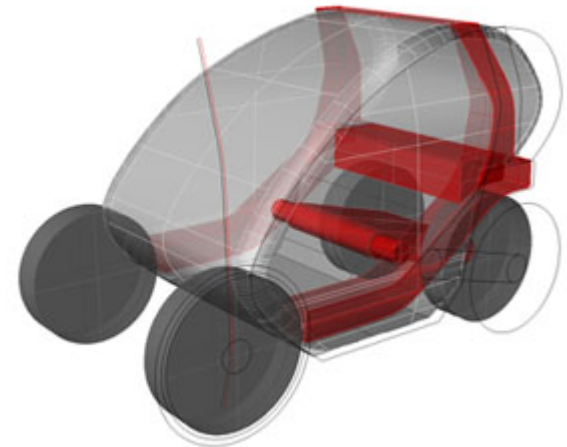
1- extra panel for front  
attack

Armor req'd  
on 4 sides

2- extra panels for  
top/bottom attack

## Personal Mobility At Separation

6 panel protection?





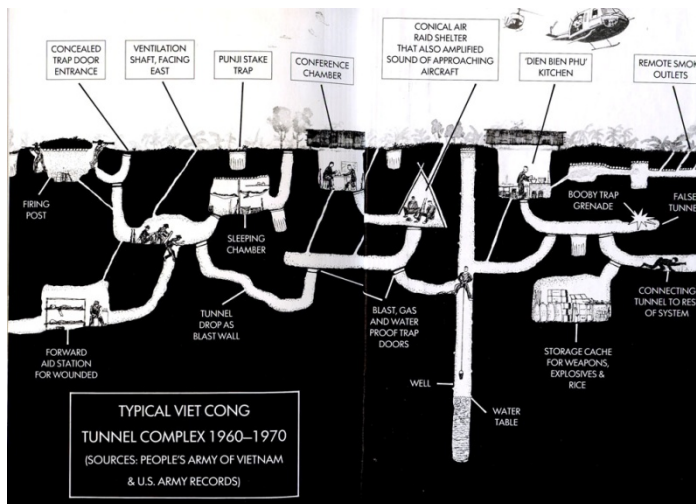
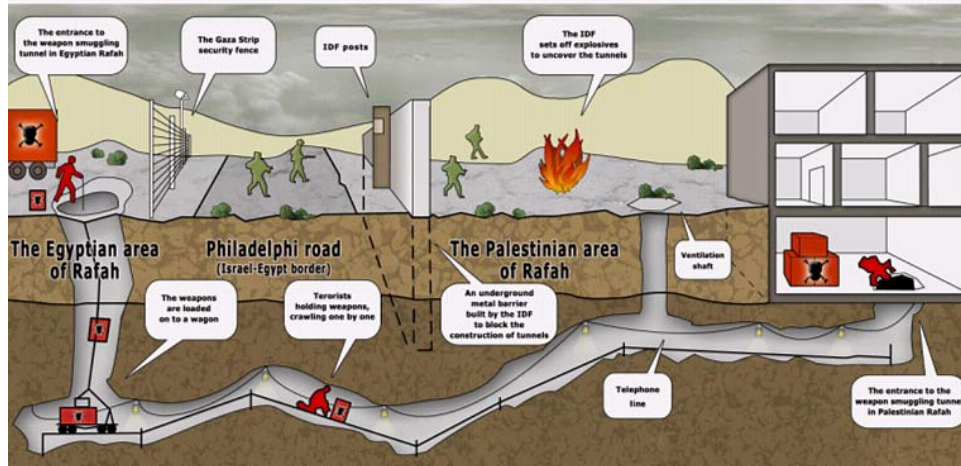


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# What Could a Vehicle Do/ Support Subterranean?

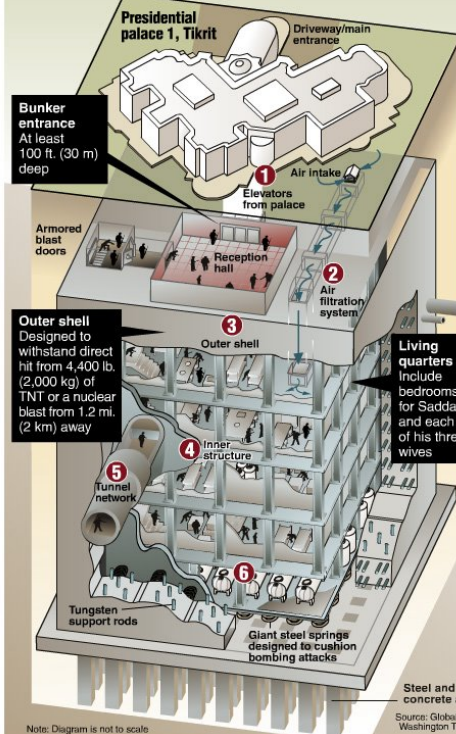


## An Illustration of the Rafah Weapon Smuggling Tunnels



## Underground bunker

What lies beneath Saddam Hussein's presidential palace at Tikrit is shrouded in uncertainty. This diagram is based on written and verbal reports detailing Tikrit and other current and former palaces. It presents a general picture of what these underground bunkers may contain and how they are constructed.



**1** Visitors report meeting Saddam in a red-tiled reception hall that had only one hallway leading to the bunker entrance

**2** Multiple air supply vents lead to elaborate series of filters, baffles to block radioactive substances, poisons, nerve agents

**3** Reinforced concrete walls several yards (or several meters) thick surround a 5-story inner structure cushioned against blasts by giant steel springs

**4** Living quarters, communications center, closed-circuit water supply, self-contained power supply, food and provisions for about 100 people

**5** Tunnels equipped with blast doors and designed to sever in response to a severe external shock

**6** Designed to support Saddam, his family and staff for up to 30 days in a conventional attack and for 5 days in a nuclear attack

Note: Diagram is not to scale

Source: GlobalSecurity.org, Defense Watch, Washington Post, Washington Times, ABC News, CBS News, National Journal Graphic, William Brown, Charlotte Observer

© 2003 KRT



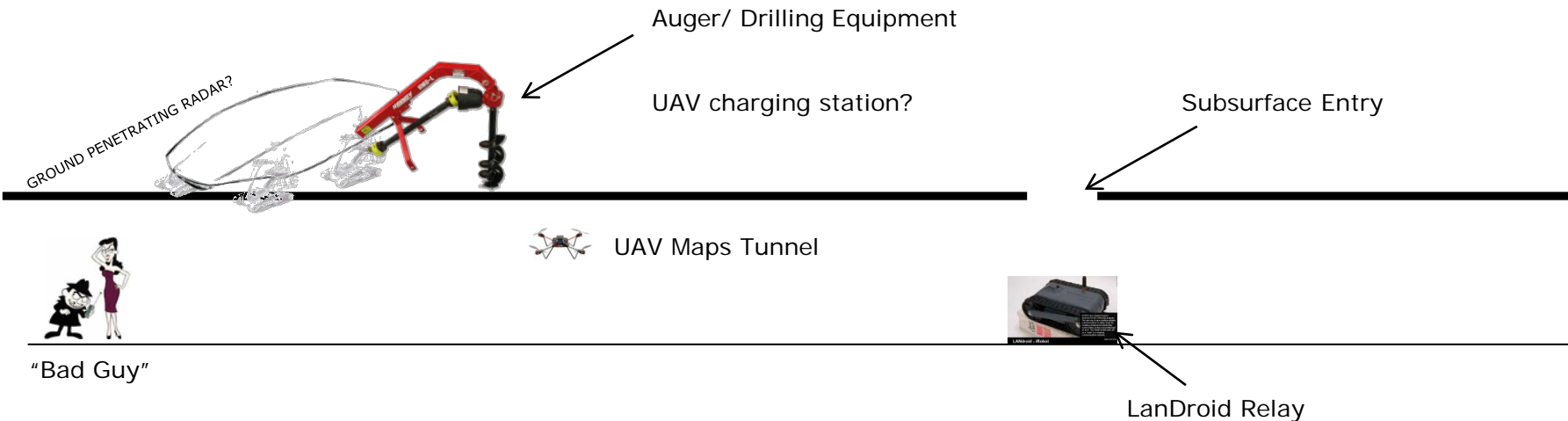
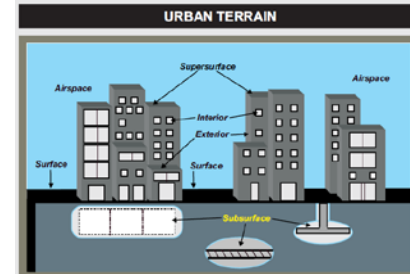


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## Subterranean Environment is 3-d



- Can the vehicle punch a hole into underground tunnels? Is this useful? (Israel tunnel down **60 ft**)
- Automatic tunnel mapping – BUT need an uplink since signals don't go through ground very well.
- Power and communications logistics are critical!





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# What I'd Really Like to Build NEED Soldier Feedback



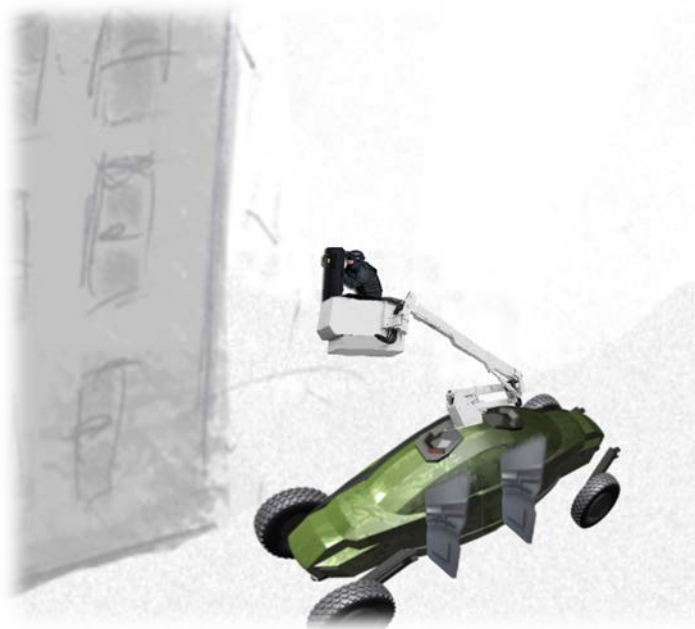
1. Need soldier input on what to build
  - Gun?
  - Bucket?
  - Can it be made modular? Interfaces?



Accessories for bucket



Tactically-optimized controls



2. Build something quick, cheap, and try it out!



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## Conclusion/ Recommendations



### Conclusions

- Future armor/ vehicles can offer more functionality than just firepower/ taxi
- Particular opportunities in melding traditional infantry, vehicles, and robot technology “swim lanes”

### Recommendations

- Hold brainstorming sessions w/ RDECOM partners and Soldiers
- Further explore engineering realism of concepts
- Do “quick win” demos first and learn “hands on”
  - Duct-tape quality prototypes– not a huge engineering efforts





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# BACKUP



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## Quick Look at the Future



- You will still need armor and an infantry
- Airpower can only hit what can be located, so the enemy will exploit this
- Fog of war will still pervade
  - Large sensor networks by both sides (you probably have 6 sensors in your pocket now)
  - Remember the goal of guerilla warfare is to influence the world public
- Robots will be available to both sides (UAV pizza delivery)
- Humans necessary when
  - Common sense or pattern recognition is necessary
  - Social interface to the population (hearts and minds)
  - Our inner "Caveman" prevents adoption: i.e. we prefer to meet face-to-face, high-touch world
- Denial of power projection. Will not be able to mass forces due to enemy precision short-range munitions (hidden from air)
- Smart mines
- Must provide ability to rapidly adapt (or produce) and deploy capabilities faster than enemy
  - "If you take the hunt for IED (improvised explosive devices) cells, that was a 30-day fight," said Cartwright. The enemy would invent a fuse, U.S. forces would develop a counter to it and the enemy would respond by inventing another triggering device. "And if it took you longer than 30 days to respond to a change in enemy tactics, your people were dying."

**Consider the role of future manned ground vehicles in urban environments...**



<http://smallwarsjournal.com/jrnl/art/mega-cities-ungoverned-areas-and-the-challenge-of-army-urban-combat-operations-in-2030-2040>

"At Nablus 2002, the Israeli Defense Forces (IDF) soldiers used none of the streets, roads, alleys or courtyards that constitute the city, and none of the external doors, internal stairwells and windows that constitute the order of buildings, but rather moved horizontally through walls, and vertically through holes blasted in ceilings and floors. This form of movement, described by the military as 'infestation', sought to redefine inside as outside, and domestic interiors as thoroughfares.

The three-dimensional progression through walls, ceilings and floors across the urban mass reinterpreted, short-circuited and recomposed both architectural and urban rules of combat. The IDF's strategy of 'walking through-walls' involved a conception of the city as not just the site, but the very medium of warfare - a flexible, almost liquid medium that is forever contingent and in flux. Innovation provided new tactics and success in this urban fight."

## **Characteristics and Problems in Mega Cities:**

- Potential for massive poverty and social unrest, especially in third world mega cities.
- Potential for massive infrastructure problems with communications services, basic infrastructure maintenance, transportation and congestion.
- Potential for environmental concerns, such as contaminated water, air pollution, and sewage.
- Potential for increased disease transmission due to over-crowding, drug-resistant strains of infection, and lethal environmental conditions.
- Potential for ungoverned spaces within the mega city.
- Potential for littoralization - the propensity for mega cities to cluster on coastlines.
- Population can be quickly mobilized with social media during times of social unrest.
- Demographics indicate higher birth rates, city migration and a young unemployed population.